

# Mixed integer quadratically-constrained programming model to solve the irregular strip packing problem with continuous rotations

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Received: date / Accepted: date

**Abstract** The irregular strip packing problem consists of cutting a set of convex and non-convex two-dimensional polygonal pieces from a board with a fixed height and infinite length. Owing to the importance of this problem, a large number of mathematical models and solution methods have been proposed. However, only few papers consider that the pieces can be rotated at any angle in order to reduce the board length used. Furthermore, the solution methods proposed in the literature are mostly heuristic. This paper proposes a novel mixed integer quadratically-constrained programming model for the irregular strip packing problem considering continuous rotations for the pieces. In the model, the pieces are allocated on the board using a reference point and its allocation is given by the translation and rotation of the pieces. To reduce the number of symmetric solutions for the model, sets of symmetry-breaking constraints are proposed. Computational experiments were performed on the model with and without symmetry-breaking constraints, showing that symmetry elimination improves the quality of solutions found by the solution methods. Furthermore, the results were compared with previous models from the literature showing that the proposed model is able to obtain numerically accurate solutions in competitive computational times. An experiment with a non-convex instance was also performed showing the performance of the proposed

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